The Role of Neighborhood Space in Fostering Sense of Community In Affordable Housing Communities In Shanghai

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Abstract

The rapid economic growth in China has intensified wealth polarization and increased the amount of low- and moderate-income people in urban area. In response to people's growing needs of housing, Chinese governments have constructed large volume of affordable housing projects. However, the insufficient and low-quality community facilities and spaces, as well as weak neighbor interaction, may insert negative impact on residents' sense of community. This study aims to explore the connection and reciprocity between the neighborhood space and the building of residents' sense of community. I employed empirical case study in the research, and observations, surveys and interviews are used to collect data. Based on the comparative case study and regression analysis of the data, my findings suggest that the sufficiency, accessibility and utilization of neighborhood physical space, as well as people's familiarity of the community, perception of neighbor interaction and willingness to talk and help, have significant correlations with the degree of residents' sense of community. Policy recommendations are provided in order to promote the community development of affordable housing communities in China.

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1. Introduction

The years between 1990 and 2016 have witnessed the rapid economic development in China that have resulted in the expanded wage gaps and intensified wealth polarization. In response to the great demands for housing from the growing amount of low- and moderate-income population in urban area, Chinese governments have been working on securing housing affordability by increasing affordable housing provision.

However, due to the high volume of affordable housing projects that are constructed annually, along with local governments' limited budget, the public facilities and services in the gated affordable housing communities (Baozhangfang Shequ) are often insufficient and of low quality. Also, affordable housing is provided for the economically disadvantaged population, meaning that people with various employment status, education levels, cultural backgrounds and lifestyles are able to become residents as long as they fulfill the requirements of income level. As a consequence, in the Chinese context, this diversity in residents' composition may have impact on neighbor interaction and community cohesion.

In China's Twelfth Five-Year-Plan (2011-2015) issued by the Chinese central government in 2010, "community building (Shequjianshe)" was emphasized with the goal of establishing more advanced community facilities and service networks, as well as operation mechanisms by 2015. And for affordable housing communities with poor condition of community facilities and complicated residents' composition, "community building" has become an even more important issue.

The Danwei ("work unit") system in China has been implemented since 1949, which basically means that state-owned enterprises whose members work and live communally. Government

directly managed residents and community affairs. After the disintegration of the Danwei system in China in 1979, communities were no longer under the immediate management of governments; residents, as the main members of a community, have been playing the critical role in community development. Their utilization of the community facilities and spaces, interaction with neighbors and perception of the living environment will significantly affect the process of "community building" As a result, scholars have been advocating strengthening residents' sense of community (SOC), which basically refers to their community recognition, in order to encourage them to participate in community affairs and therefore promote "community building"

Community facilities and spaces, as well as neighbor interaction, are what we experience every day, but their impacts on our social life have rarely been discussed. Therefore, based on the broad topic of community building, gated affordable housing communities in China and SOC, this thesis will further look into the neighborhood space in these communities and investigate its role in enhancing residents' recognition of their communities.

There is abundant literature with regards to SOC, neighborhood space and neighbor interaction individually, but very little explores the relationship among these topics. Also, most of the literature is in the field of psychology with little relevance to urban planning. Furthermore, only a small portion of the literature talks about these issues in Chinese context. The dearth of literature in this respect may result in the incomplete understanding of "community building". And without knowing the relationship among neighborhood space and SOC, affordable housing communities may become "empty shells" that are not truly a home for residents. Hence, in order to identify the connection and reciprocity between physical existence and residents' awareness building that are critical for community development, the thesis will fill in the gap and address the issues that have not been solved.

The research question of this thesis is "what is the role of neighborhood space in fostering residents' sense of community?" Neighborhood space and SOC are the two key variables. The neighborhood space is comprised of physical space that refers to community facilities and spaces, and social space that means neighbor interaction.

The purposes of this paper is to investigate the state of neighborhood physical and social space in affordable housing communities in Shanghai, explore the relationship between neighborhood space and residents' SOC, and provide policy insights to strengthen residents' SOC from the perspective of neighborhood space.

The paper begins with an introduction of "community building" in affordable housing communities in China, the statement of the research question and purpose of the study, and an overview of the structure of the paper. The background of affordable housing in Shanghai and the general description of the two cases will be in the second section. The third section is the literature review on the previous academic research and publications about SOC, neighborhood physical space and neighbor interaction. The methodology and data will be discussed in the fourth section, in which the process of case study, data collection and analysis will be detailed. Then it comes to the fifth section which is the findings and discussion. Data from observations, surveys and interviews in the two affordable housing communities will be analyzed through comparative case study and regression analysis. The implication and conclusion are in the sixth section, in which the role of neighborhood space in strengthening residents' SOC is clarified and several suggestions of policy design on "community building" from the perspectives of neighborhood space and neighbor interaction are provided.

2. Background

2.1 Affordable Housing in Shanghai

Shanghai is one of the largest cities as well as the one with fastest economic growth in China. Huge amount of immigrants pour into Shanghai every year seeking job opportunities and better living conditions. It intensified the competition on employment market and squeezed out a lot of local and non-local rivals. As a result, an increasing number of people with undesirable employment status become low-income and have to live in affordable housing. At the same time, more non-locals who secured their jobs became legal residents in Shanghai during the past decade. From 2000 to 2011, 1,259,700 people who were originally from other provinces have obtained the Shanghai "hukou" (registered residence in Shanghai). The attainment of Shanghai "hukou" simply equals the permanent residence in Shanghai, but many of the new Shanghaiers have only been staying in Shanghai for a couple of years and can't afford the expensive commodity housing. They have to apply for affordable housing instead. Therefore, in order to accommodate the great need for affordable housing, dozens or even hundreds of affordable housing projects are constructed or under construction annually. In 2011, 170,000 affordable units with a total area of 1,500,000 m^2 were delivered, and far more affordable units were generated in the following years.

The current affordable housing system in Shanghai includes low rental housing, economic comfortable housing, public rental housing and relocation housing. Low rental housing is provided for the low- and extremely low-income people who hold Shanghai "hukou", and they can get subsidies when applying for this kind of housing. The housing price and rental in economic comfortable housing is a little higher than other types of affordable housing, but the

physical condition and property management are better. Only locally registered population are eligible to apply for this type of housing. Public rental housing is open for both local and foreign population. And relocation housing is especially designed for people who previously lived in the area that is now going to be renovated or redeveloped.

Table 1: Four Types of Affordable Housing In China

Type	**Home Ownership**	**General Housing Price or Rental**	**Targeted Group**		**Benefits**
			Economic Status	**Residence Status**	
Low rental housing	Rent (can own the unit if the renter has lived there for over 10 years)	Lowest	Low- and extremely low-income people	Shanghai "hukou" holder (registered Shanghai residents)	Extra subsidies provided by the government
Economic comfortable housing	Mixed (Own or rent)	Highest	Varied in different cities	Shanghai "hukou" holder	
Public rental housing	Rent (can own the unit if the renter has lived there for over 10 years)	Median	Varied in different cities	Both locally registered and foreign population	
Relocation housing	Mixed (Own or rent)	Median	Varied in different cities	Shanghai "hukou" holder	

During the Twelfth Five-Year-Plan, Shanghai government has been working on increasing affordable housing supply through new construction and the renovation of old buildings, improving the management mechanism and promoting the construction of supporting facilities.

2.2 Description of Affordable Housing Community Cases

I select two out of the hundreds of affordable housing projects in Shanghai that were built since 1998. Both of the two communities are located close to the downtown area and surrounded by all

kinds of amenities. One affordable housing project is Shui Yue Fang in Yangpu district that is the first relocation housing project in Shanghai. It was delivered in 2003 with 722 affordable units in 3 high-rise residential buildings. The greening rate is 35% and residential FAR is 2.3. Over 300 restaurants and supermarkets, dozens of bus stations and No. 12 train are within 15 minutes' walk. Several kindergartens, elementary schools, middle school and hospitals are also around.

The other one is Xin Ning Gong Yu (or Xin Ning Apartments) in Xuhui district that was elected as one of the "most welcomed affordable housing projects in Shanghai" in 2012. (Eastday, 2012) Most of the residential units are public rental housing, meaning that most of the residents that have lived there less than 10 years are renters. The total floor area is 379,361 square meters, with public rental housing occupied 173,000 square meters, the FAR is 2.5 and greening ratio is 37%. Xin Ning Gong Yu was close to No. 1 and 3 train, dozens of middle and primary schools, hospitals and community medical centers are within 15 minutes' walk.

Figure 1: Location of the Case Communities (Source: Google Maps)

3. Literature Review

Current literature regarding the relationship among neighborhood physical space, neighbor interaction and sense of community can be categorized into two types. One includes the research that discusses about the relationship generally or only in western countries, while the other one contains the research that is particularly in China's context and explores the relationship in affordable housing communities.

3.1 Neighborhood Space, Neighbor Interaction and Sense of Community

Characterized as "social bonding"(Riger & Lavrakas, 1981), "physical rootedness" (Riger & Lavrakas, 1981) and "civic contributions" (Davidson & Cotter, 1986), sense of community basically means "the perception of similarity to others and the feeling that one is part of a larger dependable and stable structure" (Seymour B. Sarason, 1974, p. 157). It can also be interpreted as community identity or recognition in the social context that emphasizes on residents' experience of the community.

SOC is deeply rooted in and firmly associated with the physical existence of entities inside the community, which includes the community space, facilities and residents. Numerous factors have been approved to be associated with SOC in western countries, and many of which affect SOC positively. Some of the factors are about the physical space in the communities including

the public facilities, community retail and green space, some others are related to residents' willingness to communicate with others and neighbor interaction.

The community facilities and public space such as parks, playgrounds and squares provide places for people to convene and hold collective activities. According to Outi Jolanki and Anni Vilkko's study, doing things together such as cooking, maintaining communal spaces and organizing events indicates high SOC. The close proximity of neighbors helps to create more opportunities for neighbor interaction and makes people feel welcomed and connected. (Outi Jolanki & Anni Vilkko, 2015) Parks are especially important for residents' physical activities and mental wellbeing. It also creates chance encounters and facilitates local interaction. Area-level crime rate was found getting higher with lower levels of park use (Baran et al., 2014). In terms of the distribution and accessibility of the community facilities and spaces, Francis reported that SOC is found significantly correlated with residents' subjective distance to and quality of facilities and space, with negative and positive associations respectively. And the frequency in using these facilities and space seems to be irrelevant to SOC. (Francis et al., 2012)

New Urbanism suggests that SOC might be promoted by high quality pedestrian environments that would provide occasions for people to meet and encourage local interactions. (Lund, 2002) Less traffic and lower levels of land use mix would bring a much stronger SOC (Wood, Frank, & Giles-Corti, 2010). Besides, leisure walking or strolling trips, rather than brisk walking or destination trips, can help people get familiar with the community and local residents, and thus increase the SOC. (Outi Jolanki & Anni Vilkko, 2015). More nature features and higher coverage of outdoor green space would also contribute to a higher SOC. (Nasar & Julian (1995) and Kuo et al., (1998))

Homeownership is found as a primary predictor of SOC, and retail in communities also contribute to residents' physical and mental health, but the role of length of residence could not be clearly identified. (Wood et al., 2010) People's income affects their life satisfaction, but no evident relations identified between income and their SOC. (Muilenburg-Trevino, 2012) A stronger SOC is found in homogeneous groups and may be in conflicts with human diversity. Immigrants are found exhibiting a lower level of satisfaction of life that will affect their SOC, but SOC may act as a moderating factor that will alleviate immigrants' pressure and their feeling of uncertainty. (Hombrados-Mendieta et al., 2013) Qiaobing Wu and Julian Chun-Chung Chow suggested that stronger SOC helps prevent immigrants from developing depressive symptoms that might stem from their unfamiliarity with neighbors and fear of danger. And SOC can also mediate the impact of utilization of community services, in other words, "more frequent utilization of community services is associated with stronger SOC, and it will in turn leads to lower level of depression". (Qiaobing Wu & Julian Chun-Chung Chow, 2013, p. 1743) Therefore, understanding individual demands within diverse environments is crucial in forging SOC. (Townley et al., 2010).

SOC is also associated with the fulfillment of individual needs including health, social and educational needs, Nalan Yetim and Unsal Yetim approved that individual needs are closely connected with civicness and trust that have been found to be important predictors of SOC, meaning that people who regard themselves as part of the community and evaluate their neighbors positively, are more likely to have a higher SOC. (Nalan Yetim & Unsal Yetim, 2014) Mutual trust and support also contribute to SOC, the ability to offer help and chances to receive help endow people the sense of being needed and cared. (Outi Jolanki & Anni Vilkko, 2015) Gattino further revealed that, SOC and interconnection with neighbors would positively affect

residents' perception of quality of life, which will in turn exert positive impact on their SOC. (Gattino et al, 2013).

3.2 Community Building for Affordable Housing Communities In China

Because of the difference in the levels of economic development, historic backgrounds and population composition, the relations among neighborhood space, neighbor interaction and SOC have exhibited unique features in China. And when associated with community building for affordable housing, the relationships become more complicated with local factors involved and interacted with each other.

Dating back to 1949, the Danwei ("work unit") system in China was introduced and implemented. Danwei basically means that state-owned enterprises whose members were working and living communally. Workers normally lived in standardized quarters close to their factories (Hartog, 2010), and neighborhood committees with members appointed by local governments were in charge of community affairs. This geographic combination of residence and working places that were absolutely managed by governments aimed to achieve higher administrative efficiency. But since the economic reform and disintegration of danwei system in 1979, communities gradually broke away from working system and processed mere residential function. Residents, rather than governments, have become the key role in community development. (Li et al, 2014)

The housing reform in 1998 started a new affordable housing system in China consisted of four types of housing which are economic and comfortable housing, pricing-cap housing, low rental housing and public rental housing. Each of them has specific criteria of income level for applicants. While some of the affordable housing are provided for low- to moderate-income

buyers, some others are especially for even lower-income renters, meaning that affordable housing communities where very low income buyers and short-term renters aggregate may have the problem of neighborhood poverty. Based on that, various backgrounds and demands of residents will induce "resonance effect" and intensify residential differentiation. In this sense, these residents should be categorized and corresponding measures should be taken to accommodate their needs so as to elevate their satisfaction and encourage them to in the community building. (Fuping Chen, 2013) While residents' gender, age, income and educational level don't seem to have direct relations with their community recognition, the length of residence, their satisfaction of the community and neighbor interaction have been playing an more important role and are positively correlated to their SOC.

Although neighbor interaction may not be in the traditional form but it still maintains at a certain level. (Zhiqin Sang and Shaoang Xia, 2013) Furthermore, educational services, arts and cultural activities and informal community associations prove to provide value guidance and produce community memory for residents. (Ling Yang, 2013)
The neighborhood physical space is the reflection of spatial proximity and can further create social proximity among residents. But the neighborhood physical space in affordable housing communities in China is often poorly designed and far from enough. A dynamic and multilayered system of community facilities and services should be built up with efforts on enhancing mobility, strengthening interrelation among different functional zones and consolidating consistency in design characters, in order to achieve the physical integrity of the community elements which then lays the ground for social cohesion. (Feng Liu, 2013,P8). And from the perspectives of residents' consumption behaviors, service radius of various community retail and facilities, the rational combination of functionally complementary community facilities

both inside and outside of the community will assist in amplifying the collective effect and enlarging influential area. (Xiaoxiang Yi, 2012, P50)

In China and other countries, physical factors such as community facilities and open space, as well as social factors including income, educational level, safety, trust and immigrants affect SOC in a similar way. But factors such as length of residence have different impacts on SOC. Also, while commercial floor area ratio and community retail have been approved to correlate with people's SOC in western countries, not much literature talk about this relationship in affordable housing communities in China as most of the communities there don't have required commercial space inside the communities.

Several physical and social factors such as the presence of recreation space, homeownership status, length of residence have been fully or partially identified in the past studies, which would also be examined in this thesis research.

4. Methodology and Data

The primary method employed in this thesis research is case study. Two affordable housing communities in Shanghai are selected as cases to address the research question. Comparative case study and regression analysis are applied to analyze data.

4.1 Data Collection

In this study, I adopted several methods to collect data. Secondary data including the information of affordable housing and "community building" in China, neighborhood physical space, social space and SOC are obtained by reviewing academic studies, policy reports and media coverage.

Case-related primary data are collected through observations, surveys and interviews with residents in the two affordable housing communities.

All of the questions in the survey are on three themes of neighborhood physical space, social space and SOC, which are divided into three sections. Questions in the first section are residents' social characteristics such as economic status, educational levels, household size, length of residence, etc. Questions in the second section are investigation of the sufficiency, accessibility and utilization of physical space, which is based on residents' perception and represent the state of neighborhood physical space. Questions regarding social space in the section 3 are mainly about residents' familiarity and perception of, and attitudes towards neighbor interaction.

Instead of directly asking people how they evaluate their SOC, 2 questions about the impact of current physical and social space on the degree of residents' SOC were asked at the end of section 2 and 3, as the former question is too broad and vague which will make affordable housing residents who don't possess a clear concept of SOC feel difficult to answer. Also, separate questions would examine the relationship more precisely. The questionnaire mainly includes single- and multi-choice questions, and the likert-type scale is also adopted to help people answer the questions.

The participants of the survey were randomly selected from residents in the two communities. 76 people in total took the survey and 70 valid responses were received with 35 of them from SYF and the other 35 from XNGY. Each of the participants spent about 10-15 minutes on the survey. Consent had been obtained before they took the survey and oral instructions were provided when they were answering the questions.

Then based on participants' responses and their willingness to talk, about 10 among the 70 people were picked up to take the in-depth interview, among whom 5 are from SYF and the other 5 are from XNGY. The interview questions are mainly the extension of the survey questions and I asked residents more details about their perception of community space, attitudes towards neighborhood relationship, recognition of the community and their SOC. Interviewees shared their opinions in words and each interview lasted for about 15 minutes.

Another method used to collect the information is observation. During the field trip to the two communities, I walked around each community, observed and recorded the amount, type, location, feature, distance and utilization of the facilities, space and community commerce inside the communities.

4.2 Data Analysis

4.2.1 Method

The method in assessing data is comparative case study and regression analysis. Comparative case study is adopted to compare data between the two communities, when investigating the utilization pattern of physical space in the communities. Data from the observations and interviews are combined in the analyzing process.

Six models of linear regression analysis are conducted examining the correlation between the state of physical space and the degree of residents' SOC, the state of social space and the degree of residents' SOC, and the relationship between all the independent variables including residents' social characteristics and the degree of residents' SOC. Regression analysis was conducted through SPSS version 23.

4.2.2 Variables

Six regression models are involved in this research and each of them has a dependent variable and several independent variables.

The dependent variable for investigating the relationship between physical space and residents' SOC is the perceived impact of current state of physical space on participants' SOC (PhyImSOC). There are four independent variables which are participants' evaluation of the amount, type, accessibility and utilization of the facilities and spaces.

The dependent variable for examining the association between social space and residents' SOC is the perceived impact of current state of social space on participants' SOC (SoImSOC). There are four independent variables which are participants' evaluation of their familiarity of the community, perception of neighbor interaction, willingness to communicate with and offer help to other residents.

The dependent variable in the third regression analysis is the perceived impact of current state of physical space on participants' SOC (PhyImSOC), and the independent variables include the variables in the first regression analysis and all the social characteristics of participants which are employment status, income level, education level, family size, home ownership status, length of residence and future length of residence. Similarly, the dependent variable in the fourth regression analysis is the perceived impact of current state of social space on participants' SOC (PhyImSOC), and the independent variables are the ones in the second regression plus social characteristics variables.

5. Findings and Discussion

5.1 Community Profile

5.1.1 Shui Yue Fang (SYF)

Shui Yue Fang is in Yangpu District in Shanghai which has 3 residential buildings. SYF neighborhood committee, community entertainment room and a neighborhood food market are located in one of these buildings.

The size of the community is not large, and the spatial structure of the community is quite simple. The three buildings are in the northwest of the community and a community public space with many sports and recreational facilities on it occupies a large portion of land in the center and south of the community.

Both ground and underground parking is available. Public seating is provided at the recreation space and along some minor roads inside the community. Besides the food market, there is a Lian Hua supermarket at the main entrance of the community which belongs to a well-known supermarket chain and sells all kinds of foods and living goods. Other types of community retails around the community are also easily accessible.

Apart from the central recreation space (or the combination of recreation and sports area), green space, parking area, roads, and community retails and open space at the main entrances, limited public spaces are found at other parts inside the community. There is small space at the side entrance and the back entrance, with both of which are occupied by trash cans and bicycles.

Figure 2: Map and Photo of Shui Yue Fang (Source: Baidu)

5.1.2 Xing Ning Gong Yu (XNGY)

Xin Nin Gong Yu is in Xuhui District with 44 high-rise multi-family residential buildings. Some of the buildings at the three main entrances are multi-use residential buildings with retail at the first floor and residential units on the upper floors.

Buildings are evenly distributed in the community with the same direction facing the south. Roads are in a grid pattern with landscaping or small recreation area provided between buildings. A specific public space is provided at the middle entrances behind the guardroom and there is also open space at the other two entrances. There are parking stalls for vehicles and bicycles, as well as public seating along the minor roads.

Community retails are mainly at the first floor of some of the residential buildings at the three main entrances. Because of the large size of the community, it normally takes 5-10 minutes walking from the buildings inside the community to the stores. The roads coverage is higher in XNGY, and there are more open spaces at the entrances in XNGY than SYF. The sidewalks in front of the community retails are wider than those in SYF.

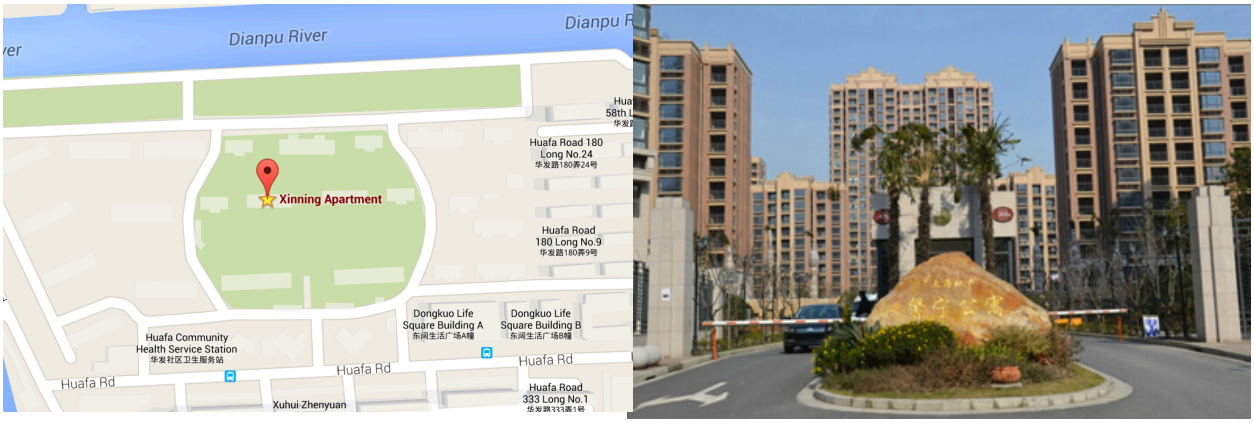


Figure 3: Map and Photo of Xin Ning Gong Yu (Source: Baidu)

5.2 Descriptive Statistics

Demographic characteristics include people's gender, age, income, education, employment status, length of residence, which are consistently associated with their SOC (Pendola & Gen, 2008). Demographics of the residents taking the survey are described below in *Table 1*.

Table 2: Descriptive Statistics of the Survey Participants

		Number	%
Total Number of Participants		70	100.0
Gender	Male	37	52.9
	Female	33	47.1
Age	<18	0	0.0
	18-40	37	52.9
	40-65	24	34.3
	>65	9	12.9
Employment	Stable job	36	51.4
	Temporary workers	20	28.6
	Retired	9	12.9
	Unemployed	5	7.1
Income	< ¥2,000 RMB	20	28.6

	¥2,000-6,000	33	47.1
	¥6,000-1,0000	16	22.9
	¥10,000-14,000	1	1.4
	> ¥14,000	0	0.0
Education	Primary school and below	14	20.0
	Middle school	23	32.9
	High school	20	28.6
	Associate Degree and above	13	18.6
Family Size	Live alone	7	10.0
	2 people	16	22.9
	3 to 4 people	32	45.7
	More than 5 people	15	21.4
Length of Residence	Less than 1 month	0	0.0
	1-6 months	12	17.1
	6-12 months	16	22.9
	1-10 years	35	50.0
	Over 10 years	7	10.0
Home Ownership	Homeowner	25	35.7
	Renter	29	41.4
	Live with relatives temporarily	11	15.7
	Live with relatives (already or will) for long time	5	7.1

In the study, about half of the participants are male, while others are female. People below 18 years old were not asked to take the survey. About 51.4% of the participants have stable jobs and 28.6% have temporary work. About 45.7% of families have 3 to 4 people. Participants' length of residence is high, with 50.0% living in the two communities for a couple of years. In terms of home ownership status, 41.4% of the participants are renters, and nearly 23% of participants don't own nor rent the home, but moved to live with the residents for uncertain periods.

5.3 Utilization Pattern of Physical Space & Associations With Social Space

Based on the observation, I specified 5 types of places inside the community which are major roads, minor roads, recreation space, sports area, community retails, and specific places, in order to investigate residents' utilization of different community facilities and spaces, and neighbor interaction triggered by various levels of utilization.

Minor roads refer to the roads between the buildings which are narrower than the main roads in the community. Recreation space includes parks, gardens, landscaping, architecture, green space, community entertainment room and other public space for residents' recreational use. Playgrounds, swimming pools, basketball or badminton courts, and sports facilities are categorized into sports area. Community retail specially means the stores inside the community or outside but close to the community entrances. Examples of specific places include parking lots for vehicles or bicycles, open area along the river, near the entrance or guard rooms, and other places where people usually visit or convene. People can choose at least 1 and at most 5 options.

There are big differences reflected in participants' selections. As shown in *Figure 2*, residents in SYF ranked major roads, recreation space and minor roads the top 3 places where they meet other residents most often. In XNGY, there are also 34 out of 35 people choosing minor roads, and 31 choosing major roads. But instead of recreation space, specific places ranked 3rd place. 23 participants in SYF chose sports area, whereas only 12 in XNGY selected it. The number of people selecting community retails in SYF is over twice of that in XNGY (133.3%).

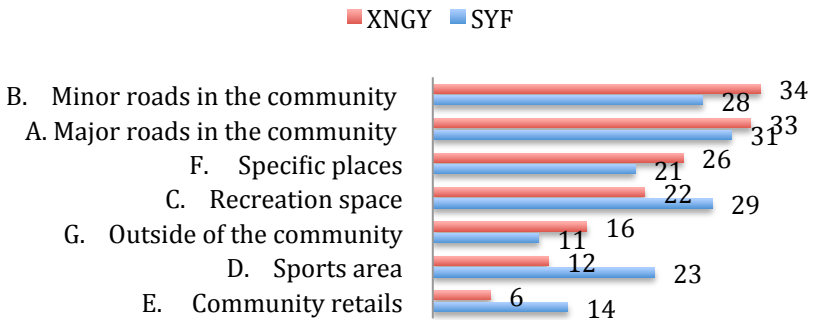


Figure 4: Public Space Where Neighbor Interaction Frequently Occur

Then I split the options into 6 questions and asked participants what they do most of the time when they are at these places, in order to find out their usual utilization of these facilities and spaces, whether these entities had achieved their goals in serving users, and how this utilization affects residents' perception of these entities and the community. Further, based on their selections of activities, questions were asked about the number of residents that are doing the same things together with the participants, so as to know the occasions where neighbor interaction usually happens. Comparative case study is used to see the differences in utilization of the physical space in the two communities.

5.3.1 Major Road

There are 31 and 33 people in SYF and XNGY respectively selecting major roads as at least one of the places where they meet neighbors most often, except "walk by", "exercise" and "chat" ranked the top 2 activities in both communities. 22 out of 35 people in SYF and 27 out of 35 in XNGY chose "exercise" (e.g., jogging, running, biking, playing balls), and 21 people in SYF and 23 in XNGY chose "chat". About 63.7% of participants who chose "exercise" in SYF and 70.4%

in XNGY would at least sometimes do it with a couple of neighbors they are familiar with. As for participants who chose "chat", the percentages are 81.0% in SYF and 69.6% in XNGY

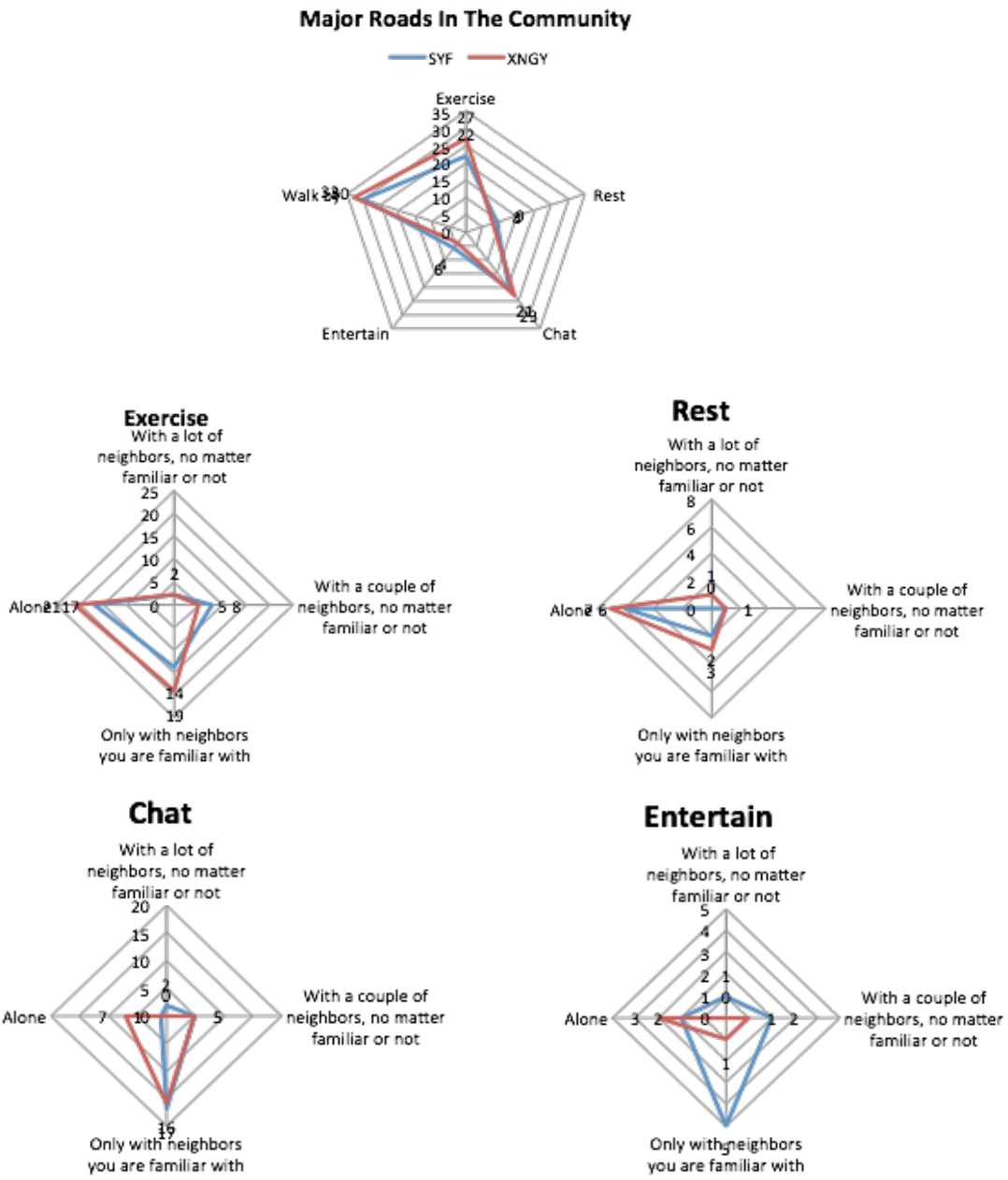


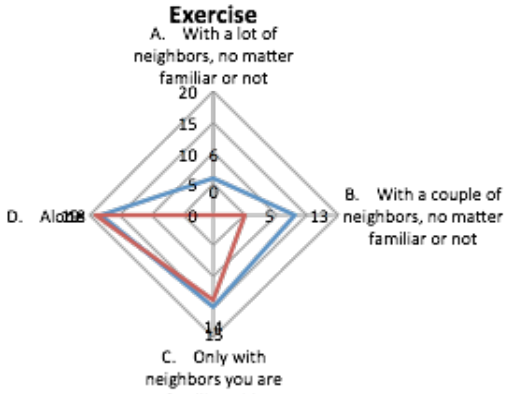
Figure 5: Residents' Utilization of Major Roads in The Community

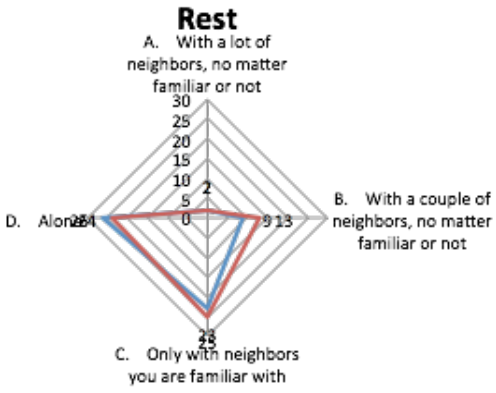
Mrs. E said that the road-network configuration in XNGY was very interesting. The roads lead people to different parts of the community and she never found the end, which made her feel

excited. She enjoyed the walking experience and she preferred walking with lots of people.

5.3.2 Minor Roads

28 people in SYF and 34 in XNGY chose "minor roads" as at least one of the places where they meet neighbors most frequently. Similar to the "major roads", except "walk by", people tend to exercise, rest and chat on minor roads. 29 people in SYF and 30 in XNGY ranked "rest" as the first selection. About 79.3% of participants in SYF and 83.3% in XNGY choosing "rest" would at least sometimes do it with a couple of neighbors they are aquatinted with. As for participants who chose "exercise", the ratios are 62.5% in SYF and 53.8% in XNGY. However, people also choose to do exercise or rest alone at least sometimes, the probabilities are a little higher than with neighbors that participants are familiar with.





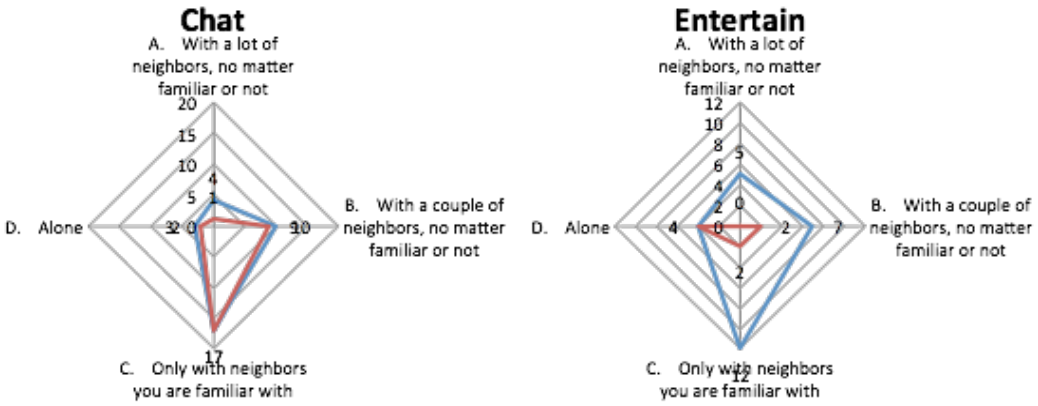


Figure 6: Residents' Utilization of Minor Roads in The Community

Mr. A said he just moved into SYF and usually jogged on the roads after dinner, he always saw a lot of people walking and running at the same time.

5.3.3 Recreation Space

29 and 22 people in SYF and XNGY respectively chose recreation area in this question. In SYF, residents' top 2 activities are "exercise" and "rest". 25 people choose to do exercise in recreation area, and 24 chose to rest. While in XNGY, the top 2 choices are "rest" and "exercise" or "chat". 20 people often rest and 14 do exercise or chat. The number of people that chose to do exercise in recreation area in SYF is 78.6% higher than that in XNGY, and more people chose "entertain" in SYF as well.

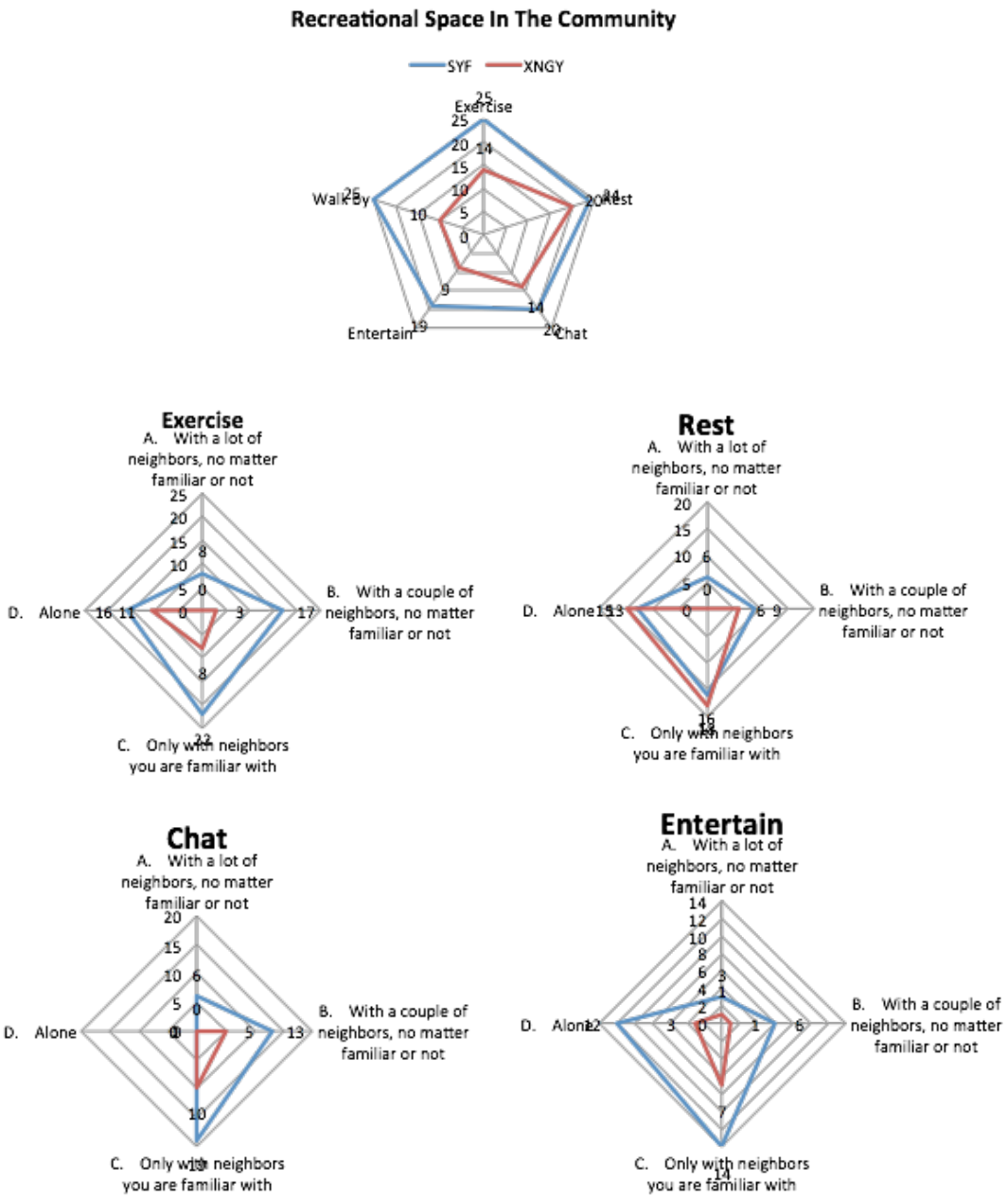


Figure 7: Residents' Utilization of Recreation Space in The Community

According to my observation, there are sports facilities provided on the central recreation space in SYF, while not so many facilities available in recreation area in XNGY. The recreation area in XNGY is relatively small where ball games or other activities that need much space are not

likely to happen. It might be the reason that people in XNGY don't usually do exercise in recreation area. Other than sports facilities, there are also plenty of tables and seats provided on the recreation area in SYF, which are only found on some minor roads in XNGY. It might also explain that more people tend to entertain in SYF.

88%, 66.7%, 95% and 73.7% of people in SYF chose to do exercise, rest, chat and entertain respectively at least sometimes with neighbors that are familiar with. Despite that fewer chose to do exercise and entertain in XNGY, they still tend to it with neighbors. In XNGY, the ratio is 57.1%, 90%, 71.4% and 77.8% respectively.

During the interview, Mr. C from SYF told me that, even though he didn't go down to do exercise in the morning that often, every time when he was walking in the community he saw many seniors doing exercise and children playing games together in the central area. There were many seats provided, where people always rest and ate. Mr. F added that, he was satisfied with the entertainment room where he always played the chess with a couple of neighbors and it was very convenient to get some drinks and food from the food market which was on the first floor of the same building. Mr. B also mentioned the entertainment room where he sometimes read books and watched people playing the chess and board games. He spoke highly of the entertainment room that provided an indoor place suitable for seniors to entertain.

In contrast, Mr. G from XNGY complained about the insufficiency of the community recreation space. He said that the recreation space in XNGY was fragmented and not attractive. Greenness are provided but people were not allowed to step on them, only some of the green space between residential buildings were open to people. But they were two small, inside which there were not enough space to rest and hold any activities that need large space. People like him always used

the seats on the minor roads to rest. However, Mr. H also from XNGY said that he liked walking trough the tiny green area under the building where he lives. He said that these areas were easily accessible and people could have private enjoyment of the greenness as these areas were provided under each building. He didn't like walking a long way to some specific recreation area and sharing the space with a lot of people.

5.3.4 Sports Area

The number of people choosing sports area as one of the places that most of their communications with neighbors occurred in SYF and XNGY are 23 and 12 respectively. Even though far fewer people in XNGY selected sports area, when it comes to activities in this type of area, "exercise" and "chat" are still the top 2 choices of people in both SYF and XNGY.

However, different from most people in XNGY that incline to do exercises either alone or only with several neighbors that they are familiar with, 75% of people in SYF chose to do exercise at least sometimes with a lot of neighbors no matter familiar or not, and 65% would like to do it at least sometimes with several neighbors no matter familiar or not. And although "chat" is the second choice for participants in XNGY, the number of people is actually only half of that in SYF which is 9. However, for people choosing "chat", there are both 88.9% of them in the two communities would do it at least sometimes with a couple of neighbors that they know.

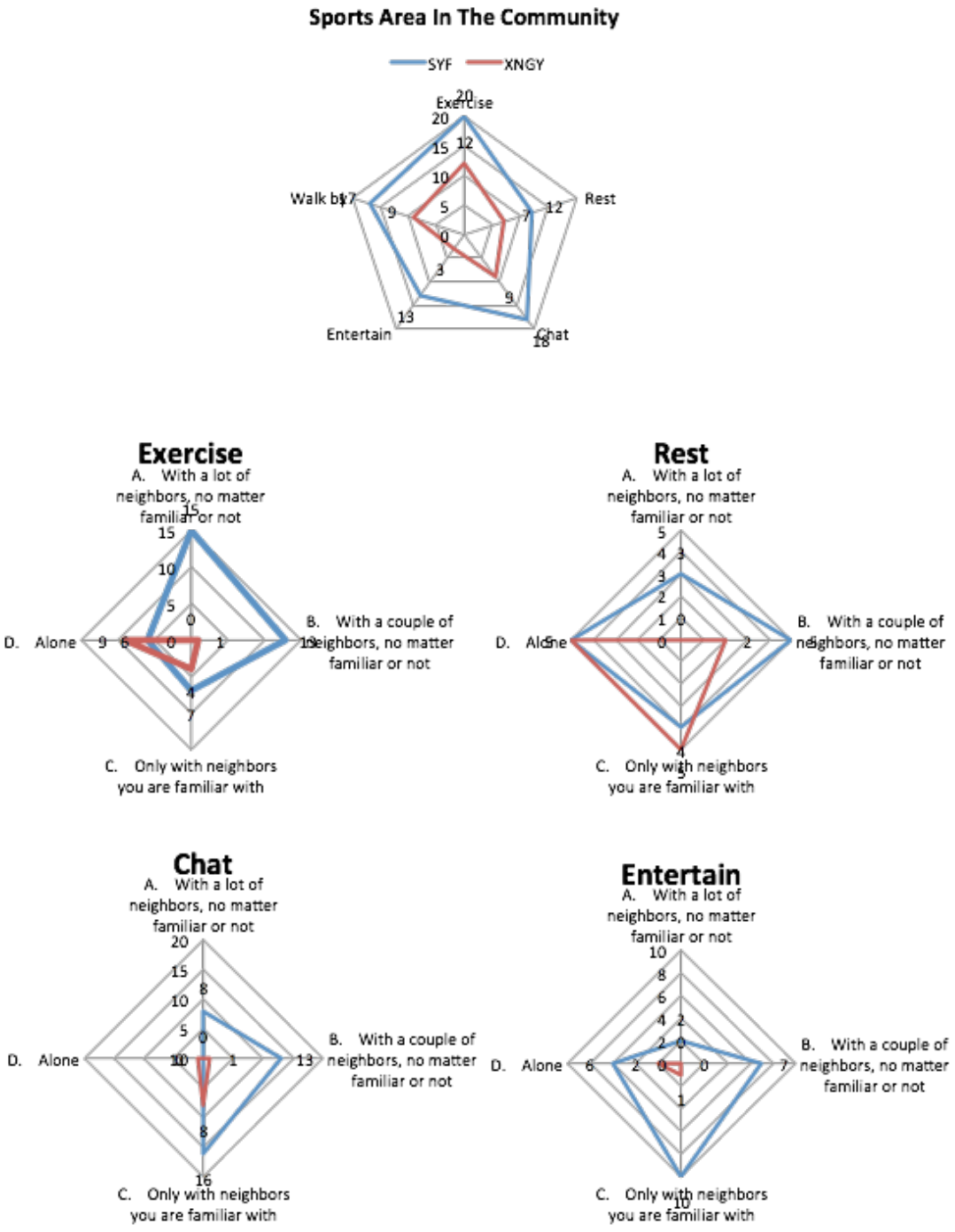


Figure 8: Residents' Utilization of Sports Area in The Community

As Mr. B from SYF said, almost everyday he would be waken up by the loud music from the central area where seniors were doing exercise and dancing together. And according to Mr. C,

even though they only had the central area in the community for doing exercise, given the small size of residents and the long history of the community, he thought that is enough.

In XNGY, some of participants expressed their dissatisfaction of the sports area. Mr. D said that there is no large area for holding activities, nor do they have enough exercise facilities to use. Mr. G complained that he usually went to the Yang Pu District Park nearby to exercise, as he couldn't find a suitable place for daily workout inside the community. Mr. H had the same opinions. He said that he had noticed there are specific space for exercise and holding activities in other communities, which was disappointingly absent in XNGY. But he also said that seniors in this community needed sports facilities far more than young people, if the majority of the residents that were the people younger than him and didn't need these facilities and space, spending money on them would be also a waste. And he also mentioned that people sometimes would discuss about the insufficiency of sports facilities and space, but many of them were also worried about the noise that would be generated from the use of these facilities and collective activities.

5.3.5 Community Retails

It is remarkable that the number of people choosing "community retails" in SYF is over twice of that in XNGY (14 in SYF and 6 in XNGY). "Entertain" and "chat" are ranked the first 2 choices in SYF, and in XNGY, the selections are "chat" and "rest". 83.3% of people from SYF and 80% from XNGY would chat with several neighbors they are familiar with. As for participants who chose "entertain", 81.3% of them in SYF would do it at least sometimes with a couple of neighbors that they know. And for "rest", there are also 33.3% of participants in SYF and 40% of those in XNGY would rest at least sometimes with neighbors that they are familiar with.

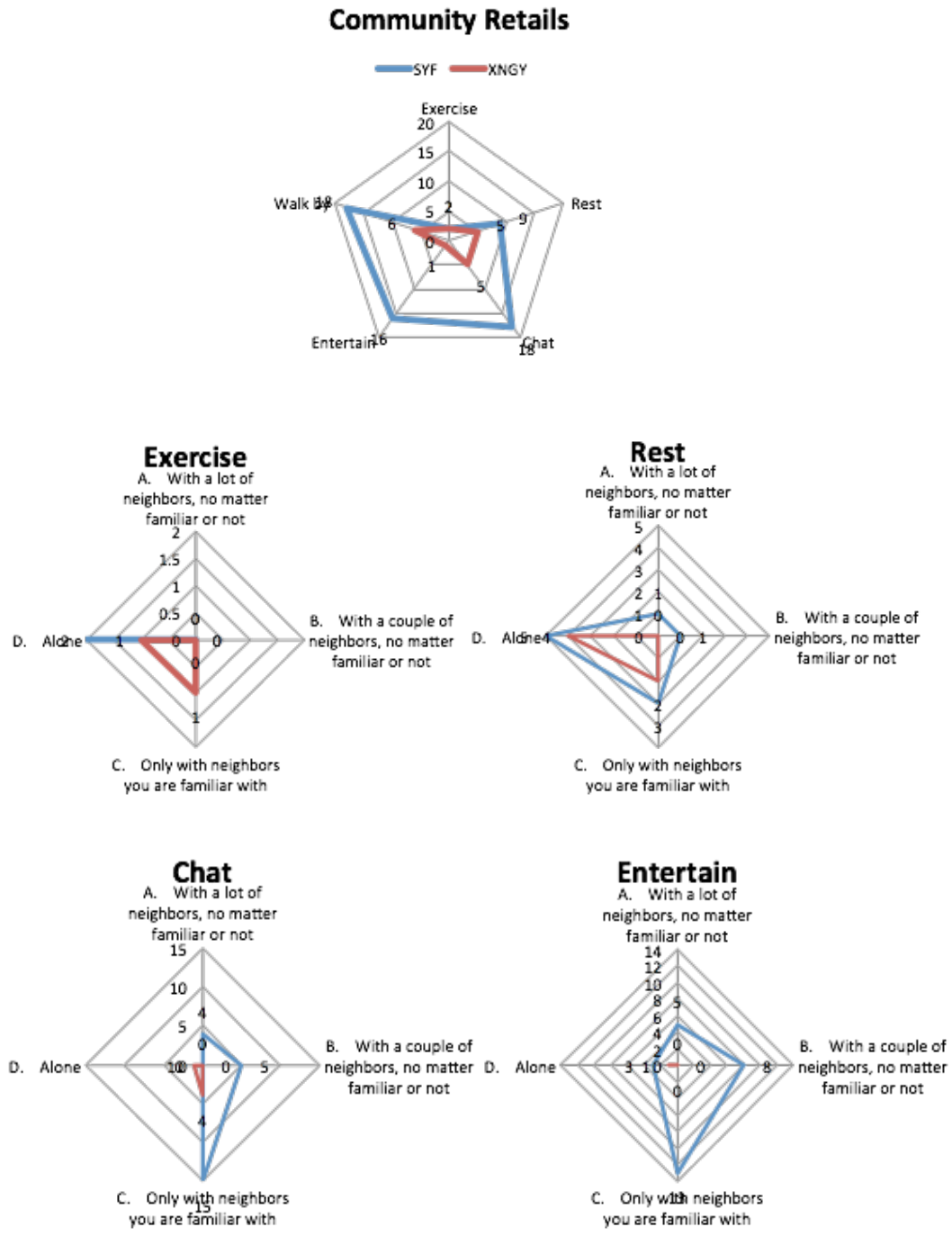


Figure 9: Residents' Utilization of Community Retails in The Community

Mrs. C from SYF said that many people especially the seniors would go to the food market and supermarket to buy foods, as it is very convenient. However, she also felt disappointed that most

of these retails sold food and small living goods which seniors were glad with, while she expected more types of retails such as salons, boutiques, appliance shops and book stores that many other people would like to visit. Mr. F said there were always lots of people in the food market, especially in the early morning and after work. It was always so crowded that he could hardly squeeze in and hoped that the food market could be renovated to hold more people.

Mr. H from XNGY said that there were various types of community retails near the main entrance of the community including stationaries, barbershops, small real estate agencies, chess and card rooms and pet shops that they usually go to. But only one or two food markets were among these retails and they were a little far away. He also mentioned that many students would go to the convenient store and the stationary, and chat at the entrance for a while after school.

5.3.6 Specific Places

26 people in SYF and 21 in XNGY chose "specific places". 71.4% of participants chose "chat" and 61.9% of them chose "rest", which are the top 2 activities at specific places in SYF. 73.1% and 53.7% of participants in XNGY chose "chat" and "exercise", which are the top 2 activities at specific places in XNGY. And in XNGY, it is noticeable that 80%, 80%, 78.9%, 66.7% of participants would do exercise, rest, chat and entertain respectively at least sometimes with a couple neighbors they are familiar with.

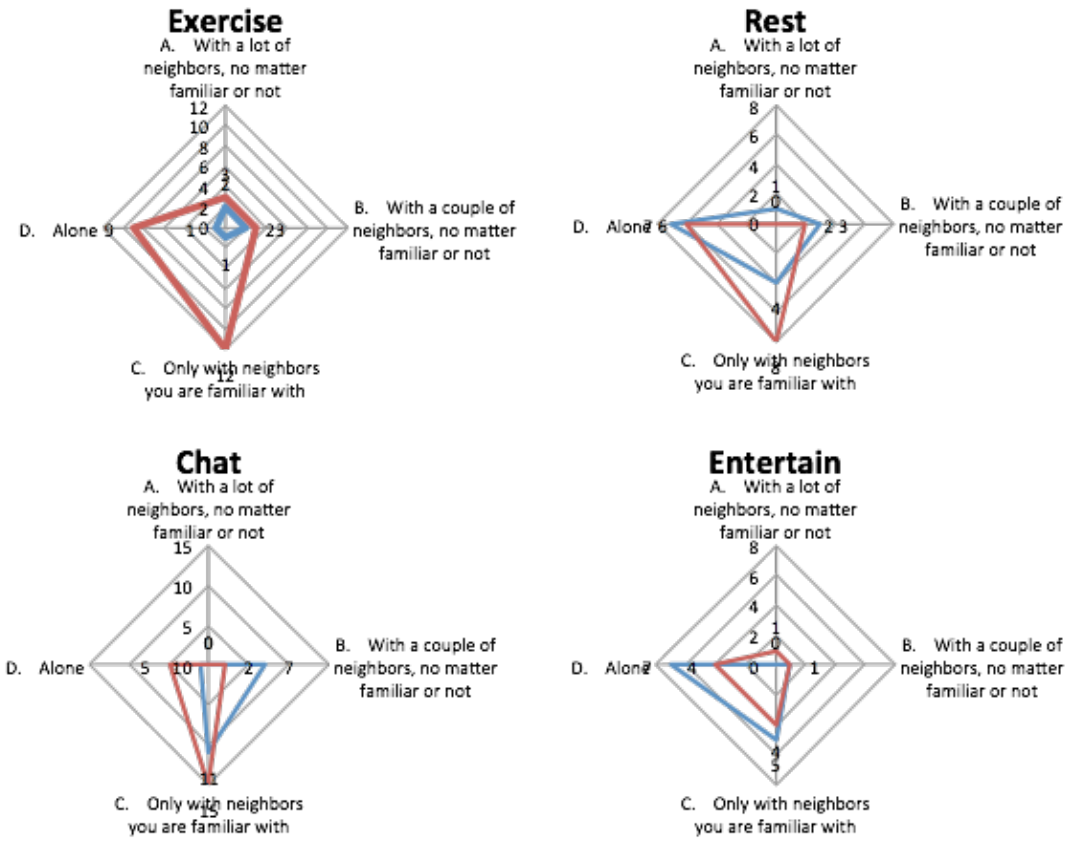


Figure 10: Residents' Utilization of Specific Places in The Community

During the field trip, I found that there is plenty of parking area along the minor roads in XNGY, and the open space at the three main entrances behind the guard rooms might also be the possible area that people would convene and have activities. The responses from the interviewees concord with my observation. Mr. D from XNGY said that he sometimes would rest on the open space at the community entrance or some other places that have seats. Mrs. E told me the same thing and added that there were people chatting at the parking stalls along the roads when the stalls were empty. Mr. H disclosed more and said that sometimes people would gather at the newsstands in the community and there were also many people aggregating at the three main entrances when they got back from work.

The utilization pattern of the neighborhood physical space and its association with other community elements could be concluded as follows:

1. The places where people usually visit and interact with other residents are a little different in the two communities. In SYF, the top 3 popular places are major roads, recreation space and minor roads, and in XNGY, the places are minor roads, major roads and specific places. Based on the responses from interviewees and my observation, the difference in the selection may be resulted from the presence, amount and accessibility of these facilities and spaces, which have associations with the configuration as well as demographics of the community.

2. Because of the differences in the amount, types, accessibility and quality of the physical spaces, the purposes that people go to these places and the types of activities that people usually do there are different.

3. Generally, exercise, rest and chat are the top 3 activities in community facilities and spaces in the two communities. And most of participants tend to do it at least sometimes with a couple of neighbors that they know or even more people that they are not quite familiar with, which means that the neighborhood physical space, especially community facilities and spaces, serve as places that residents would usually visit and convene to exercise, rest and chat, and where neighbor interaction would most likely occur or be intensified on these occasions or during these activities.

4. Physical space therefore has close associations with people's perception and evaluation of other residents, neighbor interaction and people's SOC.

Table 3: Most Popular Activates at Neighborhood Physical Space

	Top 2 Activities	With at least several neighbors	Top 2 Activities	With at least several neighbors
Location	SYF		XNGY	
Major Roads	Exercise	63.70%	Exercise	70.40%
	Chat	81%	Chat	69.60%
Minor Roads	Rest	79.20%	Rest	83.30%
	Exercise	62.50%	Exercise	53.80%
Recreation Space	Exercise	88%	Rest	90%
	Rest	66.70%	Exercise/Chat	57.1%/71.4%
Sports Area	Exercise	Over 65%	Exercise	33.30%
	Chat	88.90%	Chat	88.90%
Community Retail	Entertain	81.30%	Chat	40%
	Chat	33.30%	Rest	80%
Specific Places	Chat	73.30%	Rest	80.00%
	Rest	31.00%	Exercise	80.00%

5.4 Impact of Neighborhood Physical Space on SOC

In the survey, participants are asked to evaluate the amount, type, accessibility and utilization of the community facilities and open spaces. These four questions are used to investigate the state of physical space from various perspectives and each of them is an independent variable of which the relationship with the dependent variable will be explored later. The amount, type, accessibility and utilization of the physical space composed the residents' perception of physical space which is deemed as the state of physical space in the thesis, as the research is based on residents' perspective, no professional community planning and construction index are included. And since the community facilities and spaces are designed to serve users' needs, whether the amount, type, accessibility and quality are desirable or not should be judged by residents.

Likert scale is used in these four questions. "1" means "unsatisfied", 5 means "satisfied", from 1 to 5, the satisfaction level becomes higher. For accessibility, options are "within 5 min", "5-10 min", "10-15min", "15-20min" and "over 20 min", with scores of "5", "4", "3", "2" and "1" accordingly. The last question is the perceived impact of the current state of neighborhood physical space on the degree of participants' SOC. Participants measured the impact from -5 to 5. "-5" means "highest negative impact", "5" means "highest positive impact", and "0" means "no impact". The extent of impact gets higher from -5 to 5.

Linear regression analysis was performed to investigate the relationship between the independent and dependent variables. The dependent variable is the perceived impact of the current state of neighborhood physical space on participants' SOC (PhyImSOC), and the four independent variables are participants' evaluation of the amount (X_1), type (X_2), accessibility (X_3) and utilization (X_4) of the community facilities and spaces. The regression equation is $Y_{(PhyImSOC)}=a_1 X_1+a_2 X_2+a_3 X_3+a_4 X_4+z$. a_1-a_4 are the coefficients of the independent variables, and z is the constant.

Table 4-6: Physical Space Regression Analysis Model 1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.936[a]	.875	.868	.66878

a. Predictors: (Constant), Utilization, Type, Accessibility, Amount
b. Dependent Variable: PhyImSOC

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	204.371	4	51.093	114.234	.000[b]
	Residual	29.072	65	.447		
	Total	233.443	69			

a. Dependent Variable: PhyImSOC

b. Predictors: (Constant), Utilization, Type, Accessibility, Amount

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.308	.271		-15.875	.000
	Amount	.455	.170	.239	2.680	.009
	Type	1.007	.176	.450	5.728	.000
	Accessibility	.218	.142	.120	1.534	.130
	Utilization	.512	.160	.220	3.199	.002

a. Dependent Variable: PhyImSOC

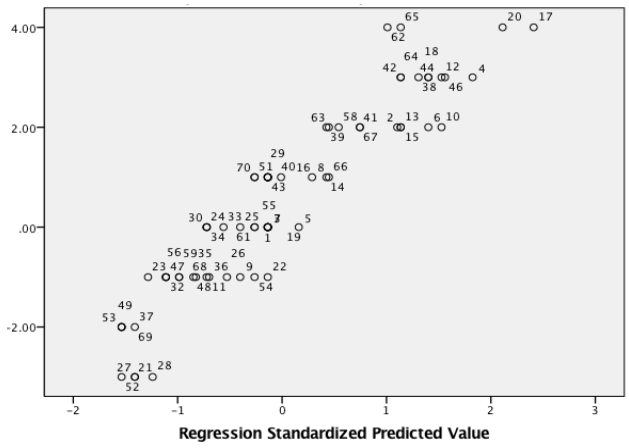


Figure 11: Scatterplot Chart of Model 1

As is sown in the tables and scatterplot chart, the linear regression equation is $Y_{(PhyImSOC)}=0.455X_1+1.007X_2+0.218X_3+0.512X_4-4.308$. All of the coefficients are positive, which means that the greater the number and types, as well as easier accessibility and higher

utilization of physical space would highly likely lead to more positive impact of neighborhood physical space on residents' SOC.

Since R^2 is 0.875, about 87.5 % of the variation in the dependent variables (PhyImSOC) can be explained by the variability in the independent variable, which is quite a large proportion. The significance is 0.000 in significance test, meaning that there is a fairly strong linear relationship between these two variables. Based on R2, significance level, the equation and scatterplot chart, it is proved that the state of neighborhood physical space positively contributes to the increase of residents' SOC.

As we further look into each independent variables, it is evident that "Amount", "Type" and "Utilization" significantly correlate with the dependent variable, with the p-values 0.009, 0.000 and 0.002 respectively, which are much smaller than α=0.05. However, "Accessibility" seems to be unrelated to the dependent variable since its p-value is 0.130 which is far greater than 0.05.

5.5 Impact of Neighborhood Social Space on SOC

As for neighborhood social space, the research purpose is to explore the current state of neighbor interaction and its impact on participants' SOC.

I first asked people how they know about the residents in the community, in order to find out their familiarity with other people. Then I asked them what they think about neighbor interaction in the community, so as to know their perception of neighbor interaction. Another two questions regarding participants' attitudes towards neighbor interaction were also raised, which are "what will you do when you bump into neighbors that you know or familiar with"(Willingness to talk) and "when neighbors need help, what will you do?" (Willingness to help)

Participants were required to use a likert scale from 1 to 5 to answer the first two questions. "1" means "undesirable" or "unsatisfied" and "5" means "perfect" or "satisfied". For the other two questions, five options were provided. People choosing A, B, C, D, E will get the scores of 5, 4, 3, 2 and 1 respectively. At last, people were asked to evaluate the impact of current state of neighbor interaction on their SOC. I set the Familiarity (X_1), Perception (X_2), Will_talk (X_3) and Will_help (X_4) as the four independent variables and the perceived impact of current state of neighbor interaction on SOC (SoImSOC) as the dependent variable. Linear regression was conducted to explore the correlation between two variables.

The regression equation in Model 2 is $Y_{(SoImSOC)}=b_1 X_1+b_2 X_2+b_3 X_3+b_4 X_4+q$. b_1-b_4 are the coefficients of the independent variables and q is the constant.

Table 7-9: Social Space Regression Analysis Model 2

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.909[a]	.827	.816	.89837

a. Predictors: (Constant), Will_help, Familiarity, Perception, Will_talk

b. Dependent Variable: SoImSOC

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	250.341	4	62.585	77.547	.000[b]
	Residual	52.459	65	.807		
	Total	302.800	69			

a. Dependent Variable: SoImSOC

b. Predictors: (Constant), Will_help, Familiarity, Perception, Will_talk

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-7.172	.479		-14.967	.000
	Familiarity	.309	.139	.143	2.228	.029
	Perception	.276	.140	.123	1.977	.052
	Will_talk	1.433	.144	.656	9.957	.000
	Will_help	.435	.134	.193	3.248	.002

a. Dependent Variable: SoImSOC

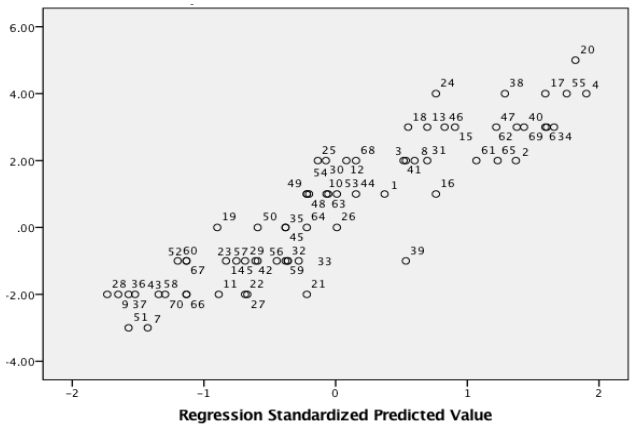


Figure 12: Scatterplot Chart of Model 2

Based on the regression analysis results, the linear regression equation is $Y_{(SoImSOC)}=0.309X_1+0.276X_2+1.433X_3+0.435X_4-7.172$. All of the coefficients are positive, indicating that people's higher familiarity with other residents, higher perception of the neighbor interaction, and greater willingness to talk with and help other residents, the more positive impact of neighbor social space on the participants' SOC.

According to the R^2, about 82.7% of the variation in my dependent variable (SoImSOC) can be explained by the variability in my independent variable (X_1-X_4), and the significance is also 0.000, indicating the strong correlation between these two sets of variables. Based on R^2,

significance level, the equation and scatterplot chart, it is proved that the state of neighborhood social space has positive impact on strengthening residents' SOC.

Specifically, the p-value for the "Perception" is 0.052, which is slightly higher than α=0.05, meaning that it is not firmly associated with the dependent variable. However, the p-values for "Familiarity", "Will_talk" and "Will_help" are 0.029, 0.000 and 0.002 respectively, showing that these three factors significantly correlate with the dependent variable.

5.6 Impact of Social Characteristics on SOC

Both Model 1 and Model 2 focus on residents' response towards multiple questions regarding neighborhood physical space, social space and residents' SOC. The results are in a general sense in which residents' social characters that may influence the outcomes are not included. In Model 3, these social characters (residents' income level, education background, home ownership status, family size, the community they belong to, length of residence and future length of residence) are taken into consideration, which, together with the previous independent variables in the two models, form the new set of independent variables, and the relationship between the independent and dependent variables will be explored again.

For each social characteristic, four or five options were provided and each of them was given a score (either A-4, B-3, C-2, D-1 or A-1, B-2, C-3, D-4). In the variable "community", "0" stands for SYF and "1" means XNGY. For length of residence and future length of residence, values of 1, 5, 10, 50, 100, 150 were given to the options.

5.6.1 Neighborhood Physical Space

In Model 3-1, the dependent variable is still the perceived impact of current state of physical space on residents' SOC (PhyImSOC_2). And the independent variables are Amount (X_1), Type (X_2), Accessibility (X_3), Utilization (X_4), Employment (X_5), Income (X_6), Education (X_7), Home Ownership(X_8), Household_Size (X_9), Len_Residence (X_{10}), Fu_Residence (X_{11}), Community (X_{12}). The regression equation is $Y_{(PhyImSOC\_2)}=C_1X_1+C_2X_2+C_3X_3+C_4X_4+C_5X_5+C_6X_6+C_7X_7+C_8X_8+C_9X_9+C_{10}X_{10}+C_{11}X_{11}+C_{12}X_{12}+e$. C_1-C_{12} are the coefficients of the independent variables and e is the constant.

Table 10-12: Physical Space Regression Analysis Model 3-1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3-1	.957[a]	.915	.897	.58945

a. Predictors: (Constant), Community, Type, Ownership, Household_Size, Fu_Residence, Education, Len_Residence, Employment, Utilization, Income, Accessibility, Amount
b. Dependent Variable: PhyImSOC_2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
3-1	Regression	213.638	12	17.803	51.239	.000[b]
	Residual	19.805	57	.347		
	Total	233.443	69			

a. Dependent Variable: PhyImSOC_2
b. Predictors: (Constant), Community, Type, Ownership, Household_Size, Fu_Residence, Education, Len_Residence, Employment, Utilization, Income, Accessibility, Amount

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3-1	(Constant)	-3.658	.595		-6.144	.000
	Amount	.601	.153	.316	3.918	.000
	Type	.796	.174	.356	4.575	.000
	Accessibility	.309	.137	.170	2.258	.028
	Utilization	.375	.160	.161	2.343	.023
	Employment	-.049	.124	-.025	-.393	.696
	Income	-.018	.082	-.014	-.216	.830
	Education	-.067	.095	-.037	-.704	.484
	Ownership	-.056	.099	-.028	-.565	.574
	Household_Size	-.137	.061	-.099	-2.254	.028
	Len_Residence	.006	.003	.095	1.817	.074
	Fu_Residence	.000	.002	.012	.266	.791
	Community	.544	.201	.149	2.700	.009

a. Dependent Variable: PhyImSOC_2

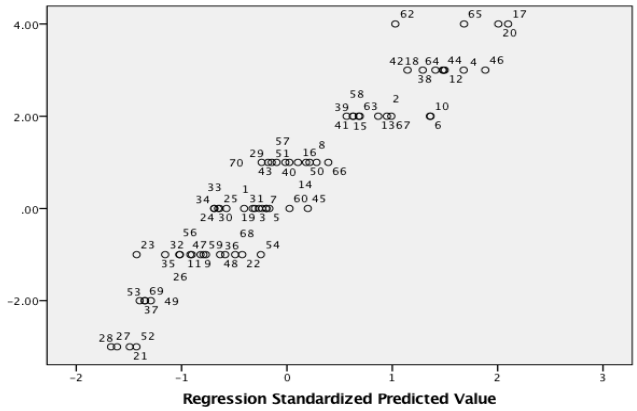


Figure 13: Scatterplot Chart of Model 3-1

As indicated in the Model Summary, the R^2 is 0.915, meaning that about 91.5% of the variation in the dependent variable (PhyImSOC_2) can be explained by the variability in independent

variable (X_1-X_{12}), and the significance remains 0.000, showing the pretty strong relationship between these two sets of variables. Then I look at the significance level of individual independent variables and found that, when considering participants' social characteristics, the p-values of "Amount", "Type" and "Utilization" are still smaller than α=0.05, and the one of "Accessibility" which is higher than 0.1 in Model 1 also becomes smaller than 0.05, meaning that these four factors are statistically significant predictors of the dependent variable. Also, the p-value of "Household_Size" is 0.028 and the one of "Community" is 0.009, meaning that they also significantly correlate with the impact on residents' SOC. However, the p-value for "Employment", "Income", "Education", "Ownership", "Fu_Residence" and "Len_Residence" are greater than α=0.05, which tells us that these independent variables are not significantly correlated or even uncorrelated with the dependent variable.

The coefficients for the first four variables are positive, showing that the more accessible, higher number, types and utilization of physical space, the higher perceived impact of current physical space state on residents' SOC. The coefficient for "Household Size" is negative, indicating that smaller household size may lead to more positive perceived impact of current physical space state on residents' SOC. This impact is more positive in XNGY than in SYF.

Then I excluded the independent variables that are not significantly correlated with the dependent variables and got the new coefficients and significant levels.

Table 13-15: Revised Physical Space Regression Analysis Model 3-1-1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3-1-1	.953[a]	.908	.900	.58273

a. Predictors: (Constant), Community, Type, Household_Size, Utilization, Accessibility, Amount

b. Dependent Variable: PhyImSOC_3

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
3-1-1	Regression	212.050	6	35.342	104.077	.000[b]
	Residual	21.393	63	.340		
	Total	233.443	69			

a. Dependent Variable: PhyImSOC_3

b. Predictors: (Constant), Community, Type, Household_Size, Utilization, Accessibility, Amount

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3-1-1	(Constant)	-4.380	.338		-12.945	.000
	Amount	.576	.150	.303	3.840	.000
	Type	.780	.164	.349	4.753	.000
	Accessibility	.354	.133	.195	2.664	.010
	Utilization	.476	.140	.205	3.408	.001
	Household_Size	-.112	.054	-.081	-2.069	.043
	Community	.687	.156	.188	4.402	.000

a. Dependent Variable: PhyImSOC_3

Base on the revised Model 3-1-1, 90.8% of the variation in the dependent variable (PhyImSOC_3) can be explained by the variability in independent variables, and the equation should be $Y_{(PhyImSOC\_3)}=0.576X_{(Amount)}+ 0.780X_{(Type)}+0.354X_{(Accessibility)}+0. 476X_{(Utilization)}-0.112X_{(Household\_Size)}+0.687X_{(Community)}-4.380$. All of the independent variables are significantly correlated with the dependent variable.

5.6.2 Neighborhood Social Space

In Model 3-2, the dependent variable is the perceived impact of current state of social space on residents' SOC (SoImSOC_2). And the independent variables are Familiarity (X_1), Perception (X_2), Will_talk (X_3), Will_help(X_4), Employment (X_5), Income (X_6), Education (X_7), Ownership(X_8), Household_Size (X_8), Len_Residence (X_{10}), Fu_Residence (X_{11}), Community (X_{12}). The regression equation is $Y_{(SoImSOC\_2)}=D_1X_1+D_2X_2+D_3X_3+D_4X_4+D_5X_5+D_6X_6+D_7X_7+D_8X_8+D_9X_9+D_{10}X_{10}+D_{11}X_{11}+D_{12}X_{12}+h$. D_1-D_{12} are the coefficients of the independent variables and h is the constant.

Table 16-18: Social Space Regression Analysis Model 3-2

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3-2	.926[a]	.858	.828	.86763

a. Predictors: (Constant), Community, Fu_Residence, Will_help, Household_Size, Familiarity, Income, Len_Residence, Perception, Ownership, Education, Employment, Will_talk
b. Dependent Variable: SoImSOC_2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
3-2	Regression	259.891	12	21.658	28.770	.000[b]
	Residual	42.909	57	.753		
	Total	302.800	69			

a. Dependent Variable: SoImSOC_2
b. Predictors: (Constant), Community, Fu_Residence, Will_help, Household_Size, Familiarity, Income, Len_Residence, Perception, Ownership, Education, Employment, Will_talk

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3-2	(Constant)	-7.220	.954		-7.564	.000
	Familiarity	.234	.148	.108	1.578	.120
	Perception	.415	.158	.185	2.629	.011
	Will_talk	1.216	.197	.557	6.184	.000
	Will_help	.429	.154	.190	2.782	.007
	Employment	-.010	.199	-.004	-.048	.962
	Income	.032	.121	.023	.266	.791
	Education	-.135	.143	-.065	-.946	.348
	Ownership	.157	.150	.069	1.049	.299
	Household_Size	.013	.089	.008	.144	.886
	Len_Residence	.003	.005	.045	.640	.525
	Fu_Residence	.007	.002	.164	2.913	.005
	Community	-.226	.316	-.054	-.714	.478

a. Dependent Variable: SoImSOC_2

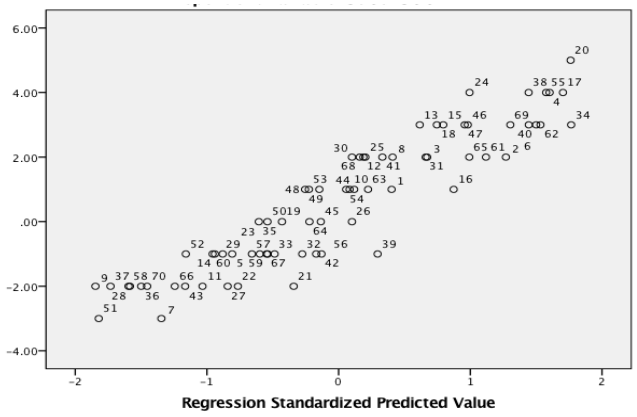


Figure 14: Scatterplot Chart of Model 3-2

The R^2 for is 0.858, meaning that about 85.8% of the variation in the dependent variable (SoImSOC_3) can be explained by the variability in independent variable (X_1-X_{12}). The

significance level is 0.000, showing the pretty strong relationship between these two sets of variables.

When taking participants' social characteristics into account, the p-values of "Will_talk" and "Will_help" remain lower than α=0.05, and the one of "Perception" which is higher than 0.05 in Model 2 now becomes smaller than 0.05 as well, but that of "Familiarity" is larger than 0.1 which seems irrelevant to the variance of dependent variable. Also, the p-value of "Fu_Residence" is smaller than 0.05, which, together with "Perception", "Will_talk" and "Will_help" are statistically significant predictors of the variance in the dependent variable, and positively affect it. On the contrary, the p-value for "Employment", "Income", "Education", "Ownership", "Household_Size", "Len_Residence" and "Community" are greater than α=0.05, telling us that these independent variables are not significantly correlated or even uncorrelated with the dependent variable.

The coefficients for "Perception", "Will_talk", "Will_help" and "Fu_Residence" are positive, showing that the higher perception of neighbor interaction, greater willingness to talk and help, longer future residence, the higher perceived impact of current social space state on residents' SOC.

Table 19-21: Revised Social Space Regression Analysis Model 3-2-1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
3-2-1	.922[a]	.851	.839	.83977

a. Predictors: (Constant), Fu_Residence, Perception, Will_help, Familiarity, Will_talk

b. Dependent Variable: SoImSOC_3

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
3-2-1	Regression	257.667	5	51.533	73.076	.000[b]
	Residual	45.133	64	.705		
	Total	302.800	69			

a. Dependent Variable: SoImSOC_3

b. Predictors: (Constant), Fu_Residence, Perception, Will_help, Familiarity, Will_talk

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3-2-1	(Constant)	-7.149	.448		-15.958	.000
	Familiarity	.274	.130	.126	2.106	.039
	Perception	.354	.133	.158	2.670	.010
	Will_talk	1.308	.140	.599	9.348	.000
	Will_help	.414	.125	.183	3.304	.002
	Fu_Residence	.007	.002	.167	3.223	.002

a. Dependent Variable: SoImSOC_3

However, after excluding most of these insignificant independent variables except "Familiarity", the revised regression model 3-2-1 has the most independent variables that are significantly correlated with the dependent variable.

In Model 3-2-1, 85.1% of the variation in the dependent variable (SoImSOC_3) can be explained by the variability in independent variables, with the significance level of 0.000. The equation is $Y_{(SoImSOC\_3)}=0.274X_{(Familiarity)}+0.354X_{(Perception)}+1.308X_{(Will\_talk)}+0.414$

$X_{(Will\_help)}+0.007X_{(Fu\_Residence)}-7.149$. All of the independent variables significantly correlate with and positively affect the dependent variable.

5.7 Discussion

This study aims to examine the role of neighborhood physical and social space in strengthening residents' SOC. Empirical case study is conducted to solve the research questions, and surveys, interviews and observations are major tools used to investigate the specific relationship among various research objects. In the data collection and analysis process, participants' responses reflecting their behaviors, perception and attitudes, as well as participants' social characteristics are taken into account when performing comparative case study and regression analysis.

The study proves that, on an aggregate level, the sufficient (amount and type), easily accessible and highly utilized neighborhood physical space positively affects the degree of people's SOC. And on the individual level, the sufficiency, accessibility and utilization status are still strong predictors of SOC. The finding of the significance of these three factors accord with the previous research that residents' subjective distance to facilities and space negatively affect SOC respectively (Francis et al., 2012). Further, the study has revealed the utilization pattern of various types of neighborhood physical space and verified that roads, recreation space, sports area, community retails and specific places are the most popular locations in the community that people usually visit, convene and have activities together with at least a couple of neighbors, during which the neighbor interaction is stimulated and intensified. As pointed out in other studies, community retails contribute to residents' physical and mental health (Wood et al., 2010) Parks also create chance encounters and facilitate interaction, which is important for residents' physical activities and mental wellbeing. (Baran et al., 2014)

Homeownership may positively influence SOC, but given the significance level much higher than 0.05 which is 0.574, it is not deemed as an important predictor of the growth of SOC. This

is in conflict with the previous finding that homeownership is the primary predictor of SOC, but this conflict may result from the different options of homeownership status in different surveys and the specific homeownership requirements of public rental housing in China. Besides, household size is a strong predictor negatively affecting SOC, which has not yet been fully studied in other research.

In terms of neighbor interaction, on an aggregate level, it is noted that (a) people's familiarity with other residents in the community positively affect their SOC, (b) people's willingness to communicate with neighbors is a strong predictor of their SOC, (c) the willingness to help other residents also increases SOC. On the individual level, the familiarity doesn't significantly correlate with the increase of SOC, whereas people's perception of the neighbor interaction does. It is noted that the willingness to talk and help are still primary predictors of SOC. The ability to offer help and chances to receive help endow people the sense of being needed and cared. Mutual trust and support growing through communications and help contribute to SOC. (Outi Jolanki & Anni Vilkko, 2015)

Also, future length of residence is found to predict SOC, which is found not significant in the first model investigating the role of physical space and not many relevant research were found. Length of residence also seems to have positive correlations with SOC, but due to its p-value (0.052) slightly higher than 0.05, the correlation appear to be not statistically significant, and the significance level of length of residence in the first model is also higher than 0.05 which is 0.074 and therefore is insignificant. The finding of length of residence verifies the previous studies that the impact of length of residence could hardly be identified. (Wood et al., 2010).

Even though I noticed that many participants with unstable working status exhibited an indifference of the community and other residents, and that people with middle and high school backgrounds care more about the community than those with associate degree or above, employment, income and education appear to have no significant effects on the SOC in the regression analysis, which confirmed what Muilenburg-Trevino (2012) has indicated that income has influence on life satisfaction, but no evidence found about the relationship between income and SOC.

In the interview, individual responses revealed more details about the community facilities and neighborhood communication. The central area in SYF attracted many residents to visit, rest and have physical activities, while in XNGY there is no such a large place which disappointed many residents. However, because of the existence of other types of public spaces such as the small recreation space between the residential buildings, parking stalls along the minor roads, community entertainment room and the open space at the three main entrances, people are still provided with plenty of opportunities to enjoy the community. Some people also expressed their satisfaction of the existing physical space status in SYF. The retails in SYF are more easily accessible than those in XNGY, and people are glad with the large food market and supermarket. But some people complained about the absence of many other types of retails such as boutiques, appliance stores and pet shops. In XNGY, partly due to the large size of the community, many retails cannot be reached within 5 minutes. Especially for people living in the buildings in the back of the community, they have to walk for a long distance to purchase goods. However, there are various types of retails around XNGY that suit the needs of people in different age groups, and people are satisfied with it although they have to walk for a distance to get there.

The positive impacts of length of residence and homeownership are reflected in the interviewees' responses. Some local people that have lived in the communities for several years expressed their concern of public safety, neighborhood communication and community cohesion. They felt uncomfortable living with so many short-term renters that were originally from other provinces and wished to have more stable and reliable neighbors. This reluctance in accepting new neighbors leads to their unwillingness to communicate and help other residents. Mr. C said that he has been living in SYF for about 10 years. The deep attachment with the community made him regard the community as his home. Mr. B felt sad that he used to chat with the neighbors after work and felt unconformable now seeing so many new faces around. And Mr. F also mentioned that renters keeping moving in and out made him feel unsafe and sometimes he even refused to help them. For interviewees that have not been living here for a long time, they didn't know or care the community and other residents that much, and neither do they feel uncomfortable with other short-term non-local renters. The conflicts in regression results and interviewees' answers may due to the limited size of survey participants. That is to say, if over 100 participants took the survey, the correlation between homeownership and SOC, and length of residence and SOC would be more clear.

6. Implication and Conclusion

6.1 Policy Recommendations

The study results have several policy implications. Length of residence and future length of residence may probably have positive impact on strengthening SOC, meaning that in public rental housing and low rental housing communities where most of the residents are renters, their SOC may possibly be lower than homeowners in other types of affordable housing communities.

Hence, governments should especially focus on the community building at the affordable housing communities where renters occupy a large portion of residents.

In light of the neighborhood physical space, the amount and types of community facilities and spaces in affordable housing communities in Shanghai are usually at an undesirable level, and some of which are beyond the walkable distance. Because of the inconvenient location and low quality, these facilities and spaces are not efficiently utilized. Therefore, in order to increase residents' recognition and satisfaction of the community, planners should make efforts to provide more facilities and spaces for people to use and locate them at the places that people can get easy access to. The high quality and user-friendly feature of the facilities and spaces, as well as the periodical repair and maintenance of them should also be stressed, so as to make them more attractive.

There are also implications with regards to neighbor interaction. Given the finding that stronger neighbor interaction leads to higher SOC, apart from providing more physical space to stimulate neighbor interaction, more formal or informal occasions and activities where people can communicate with each other should be created. Just like the entertainment room in SYF, neighborhood committees could provide residents a specific place for gathering and entertaining such as a reading room, a public outdoor room or a small square. Neighborhood committees should also hold activities and invite resident to participate which are great chances for meeting each other. Educational exhibitions and classes which teach people to make efforts on building a harmonious community are also good choices.

6.1 Research Conclusion

This research aims to discover the role of neighborhood physical and social space in strengthening residents' SOC in affordable housing communities in Shanghai. Physical space refers to the community facilities and spaces, and social space means neighbor interaction. SOC is defined as people's community recognition and the sense of being part of the community in this study.

In terms of data collection and methodology, apart from searching and reviewing secondary data, empirical case studies were conducted in two affordable housing communities in Shanghai to collect primary data. Observations, surveys and interviews are the key methods in the process of data gathering, and data were analyzed through comparative case study and regression analysis.

In the surveys and interviews, 70 residents were asked to answer questions with regards to their perception of the amount, type, accessibility and utilization of the physical space, their familiarity of the community, perception of neighbor interaction and their willingness to communicate with and offer help to other residents. Participants' social characteristics including income, education, employment status, household size, and length of residence were also recorded.

Comparative case study is conducted to see the difference in utilization pattern of the physical space and the association between physical and social space. According to the findings, except the major and minor roads which are among the top 3 popular places in both communities, the recreation space in SYF and specific places in XNGY are also ranked as one of the locations where people visit most often in the two communities. Based on the responses from interviewees and my observation, the difference in popular places is resulted from their presence, amount and

accessibility. The large central recreation space with plenty of sports and rest facilities on it in SYF acts as the major place for people to visit and have activities, and some specific places such as parking stalls along minor roads, and open spaces at the three main entrances in XNGY also attract many people.

Even though the amount, types, accessibility and quality of the physical spaces in the two communities are different, exercise, rest and chat are generally the top 3 activities at these places. And most of participants would do it at least sometimes with a couple of neighbors that they know or even more people that they are not quite familiar with, indicating that the utilization of physical space is associated with social space. In other words, neighbor interaction is stimulated or intensified when people have activities (exercise, rest, chat and entertain) at these places, and in turn stronger neighbor interaction would affect people's perception and utilization of physical space as well.

Regression analysis is the other method used in analyzing survey data. By first excluding and then incorporating social characteristics in two sets of regression models, I examined data at both aggregate and individual levels. On the aggregate level, the analysis results verifies that (a) sufficient, accessible and high-quality community space and facilities have positive effect on strengthening residents' SOC, (b) the stronger the neighbor interaction is, the higher its contribution to the growth of residents' SOC would be. These are the two hypotheses raised at the early stage of this study and proved at last. On the individual level, one of the primary predictors becomes insignificant but it doesn't affect the confirmation of the hypotheses and the conclusion is still valid. Besides, participants' social characteristics are also found have impact on residences' SOC. Household size and future length of residence significantly correlate with SOC, with negative and positive effect respectively. The study also reveals that the higher

presence of recreation space and community retails, higher willingness to talk and help people lead to higher SOC, which accord with other studies. The impacts of income and length of residence that have been studied in other research are also partially verified. However, the findings of homeownership status dispute with previous studies with no significant correlations found in this research.

One strength of the study is that it largely depends on primary data and the data was collected through a combination of surveys, interviews and observations, which make the results of the study more reliable. Another strength is the examination of the neighborhood physical space, social space and SOC at both the individual and aggregate levels. Differences reflected in the two models could help to identify the influence of individual social characters on people's SOC. Further analysis with irrelevant predictors excluded was also conducted to find out the most valid predictors and relationship.

The study also has limitations, one of which is concerned with the size of survey participants. Data from 70 people may not be able to produce and support a highly stable and precise estimation of residents' community recognition and SOC. And since the study focuses on the affordable housing communities and residents in China, it should be reexamined in different political and cultural contexts in order to generalize the findings.

Community building in affordable housing communities may take a long time to realize, and residents' SOC is also hard to be increased onto a high level. But as long as we try to improve the neighborhood physical and social space, residents' SOC would be likely to be strengthened.

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8. Annex

8.1 Survey (Structured Interview) Questionnaire

1. How old are you?
   A. <18
   B. 18-40
   C. 40-65
   D. >65

2. What is your employment status?
   A. Stable job
   B. Temporary workers
   C. Retired
   D. Unemployed

3. What is your income level? (Per month)
   A. <2,000 RMB
   B. 2,000-6,000 RMB
   C. 6,000-1,0000 RMB
   D. 10,000-15,000 RMB
   E. >15,000 RMB

4. What is your education level?
   A. Primary school and below

B. Middle school
C. High school
D. Associate Degree and above

5. What is your family size?
A. >= 5
B. 3-4
C. 2
D. Live alone

6. How long have you been living here?
A. <= 1 month
B. 1-6 months
C. 6-12 months
D. A couple of years
E. Over 10 years

7. What is your home ownership status?
A. Homeowner
B. Renter
C. Live with my relatives temporarily
D. Live with my relatives (already or will) for a long time

9. How long do you plan to stay here?
A. No more than half a year
B. No more than 1 year
C. 1-5 years
D. 6-10 years
E. Over 10 years

10. What type of public space you are at most of the time when meeting or interacting with neighbors? (Multi selections)	11. What are you doing at those occasions? (Multi selections)	12. How many of you doing this most of the time? (exclude family members, multi selections)
A. Major roads/sidewalks in the community	A. Exercising; (jogging, running, biking, playing balls)	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not

	B. Rest; (Eat, Nap, Read, listen to music / radio, wander) C. Chat; D. Entertain;(play cards / chess /board games, sing, dance) E. Just walk by;	C. Only with neighbors you are familiar with D. Alone
B. Minor roads/sidewalks between buildings in the community	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with neighbors you are familiar with D. Alone
C. Recreation space in the community (parks, gardens, landscaping, architecture, reading room, etc.)	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with people you are familiar with D. Alone
D. Sports area (playground, basketball / badminton court, sports facilities, etc.)	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with neighbors you are familiar with D. Alone
E. Community retails	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with people you are familiar with D. Alone
F. Specific places (along the river, near the community gates, near the bicycle	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with neighbors you are familiar with

parking lot, etc.)		D. Alone
G. Outside of the community	A. Exercising; B. Rest; C. Chat; D. Entertain; E. Just walk by;	A. Together with a bunch of neighbors, no matter familiar or not B. With a couple of neighbors, no matter familiar or not C. Only with neighbors you are familiar with D. Alone

13. How do you think of the community facilities and spaces?

	1(Undesirable)	2	3	4	5(Satisfied)
Amount					
Type					
Utilization					
Accessibility	>20 min	15-20 min	10-15 min	5-10 min	< 5 min

14. How do you think the contribution of current state of neighborhood physical space to the growth of your "Sense of Community" (i.e. community recognition and the sense of being part of the community)?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Highest negative contribution					No contribution					Highest positive contribution

15. How do you know about other residents in the community?

1	2	3	4	5
Not at all				Very Well

16. What do you think about neighbor interaction in your community?

1	2	3	4	5
Weak				Strong

17. What will you do when you bump into neighbors that you know or familiar with (if you don't have any urgent issues to deal with)?

A. Stop and talk a lot
B. Chat for a short time
C. Only greetings
D. Pretend not to have seen
E. Verbal attack

18. When neighbors need help, what will you do?
    A. Help them without hesitation, no matter you can manage to solve the problems or not.
    B. Decide to help or not after thinking of your capability and weighting the advantage and disadvantage
    C. Ask other people to come and help them until there are other people with you
    D. Ask other people to come but choose not to go help them
    E. Pretend not to have seen or walk away

8.2 In-Depth Interview Questionnaire

1. How do you think of the neighborhood physical space in your community?

(1). Amount and types?

(2). Utilization?

2. When neighbors need help, what will you do?

3. When you are in trouble will you ask other residents for help? Why?

4. Do you have the "sense of community", what do you think it is?

5. What do you think is the obstacles in fostering residents' "sense of community " in your community?

6. What do you think can be done to strengthen people's "sense of community"?